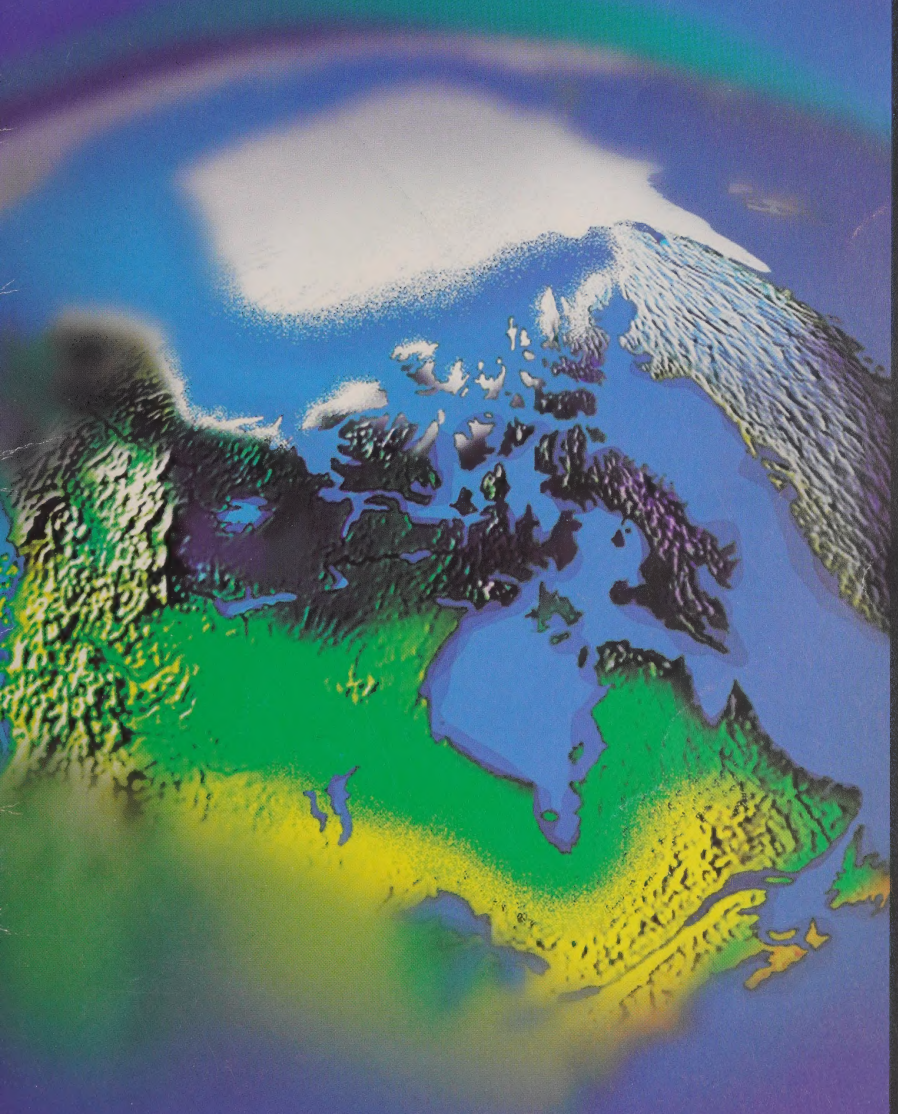
Government of Canada Action Plan 2000 on Climate Change

Plan d'action 2000 du gouvernement du Canada sur le changement climatique



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Introduction

The Kyoto Protocol is an agreement negotiated by more than 160 countries in December 1997, in which industrialized countries undertook to reduce their collective emissions of greenhouse gases (GHGs) by 5.2 percent below 1990 levels by the period 2008—2012. Canada's target is to reduce GHG emissions to 6 percent below its 1990 levels, a commitment which is in line with our major trading partners.

Climate change is a global challenge that requires a global response. Canada must be part of the solution. Along with other nations around the world, we are taking action designed to reduce greenhouse gas (GHG) emissions. Addressing this issue is one of the greatest environmental and economic challenges ever undertaken by Canada.

It is now widely recognized that the Earth's climate is changing. Within our lifetime, lasting impacts of climate change could occur in Canada, including coastal areas and the North, affecting natural habitats and changing the Canadian landscape. Already, people in Northern Canada are experiencing shorter seasons for winter roads of snow and ice, their only means of ground transportation. They are also reporting changes to migration patterns of caribou and fish. Scientific models suggest that extreme weather events, such as violent storms and major floods, could become more frequent.

In 1998, at the direction of Canada's First Ministers, more than 450 experts from industry, academia, non-government organizations and municipalities and federal, provincial and territorial governments joined in a two-year consultation process to develop solutions needed to address climate change. Initiatives in this document draw extensively from the results of this work, capture many of the best ideas and focus on strong actions to reduce emissions. No other country has adopted such an open, inclusive and comprehensive process.

The provinces and territories, along with the Government of Canada, are putting forward a series of actions that will form the *First National Climate Change Business Plan*.

The comprehensive package outlined in the *Government of Canada Action Plan 2000 on Climate Change* reflects the Government of Canada's contribution to the *First National Climate Change Business Plan*, and its intention to invest up to $500 million on specific actions to reduce GHG emissions. This investment, along with the $625 million over five years announced in Budget 2000, results in a commitment of $1.1 billion over the next five years. This builds on the $850 million that the Government of Canada has spent during the previous five years.

Action Plan 2000 targets key sectors and, when fully implemented, will take Canada one third of the way to achieving the target established in the Kyoto Protocol. It will reduce Canada's GHG emissions by about 65 megatonnes per year during the commitment period of 2008-2012. The remainder of Canada's Kyoto target will be addressed by actions in future plans.

The measures outlined in *Action Plan 2000* will help Canada become a world leader in sustainable development and one of the smartest nations on Earth in the production and use of all forms of energy. Canadians can also expect other direct benefits from this investment, including cleaner air; cost savings from energy efficiency measures; and expanded use of renewable energy technologies.

Over the next few months, the Government of Canada will further develop these proposals. It will work with provincial and territorial governments, and stakeholders, to fine tune the measures, and seek partnerships and contributions.

Funding for the final package of measures will be announced in Budget 2001. Provincial and territorial governments are also working to confirm their contributions to the *First National Climate Change Business Plan*.

This is the first in a series of Business Plans that Canada will undertake to deal with climate change. We will also continue to analyse future policy options, including domestic emissions trading. Countries are currently negotiating the best way to implement the Kyoto Protocol. As the international rules become clearer, Canada will develop further business plans to achieve our climate change objectives.

Action Plan 2000—Targeting Key Sectors

Action Plan 2000 focuses primarily on GHG emission reductions and sets the stage for future measures. *Action Plan 2000*:

- Reduces Canada's GHG emissions in a cost effective way;
- Draws extensively and captures the best ideas from the provinces, territories and stakeholders;
- Sets the course for action in all sectors of the Canadian economy;
- Encourages action by industry and consumers;
- Builds partnerships and complements measures and actions by the provinces and territories to address issues of regional interest; and
- Lays the groundwork for long-term behavioural, technological and economic change.

Action Plan 2000 is based on coordinated, sustained and informed action by governments, industry, interest groups and individual Canadians. It puts Canada well on the path to achieving significant cost-effective GHG emission reductions.

Our approach targets key sectors that account for over 90 percent of Canada's GHG emissions. *Action Plan 2000* contains initiatives in the following areas: transportation, energy (oil and gas production and electricity), industry, buildings, forestry and agriculture, international projects and investing in future solutions (technology, as well as science and adaptation).

Partnerships

Canada's response to climate change is characterized by partnerships.

For over two years, federal, provincial and territorial governments have worked with municipalities, industry, environmental groups and many others to build a national strategy. This practical, step-by-step approach creates a realistic, cost-effective plan for Canada that allows us to work together to reduce GHG emissions.

The Government of Canada will continue to work with provincial and territorial governments and partners to implement the *First National Climate Change Business Plan* and develop subsequent plans in the coming years.

Greenhouse Gases (GHGs)

The Earth's atmosphere is a mixture of many gases that absorb the sun's heat and radiate it back to the Earth's surface, trapping it like a greenhouse. Without this natural greenhouse effect, the Earth would be much colder than it is now — about 33°C colder — making the average temperature on the planet -18°C and inhospitable to life. More and more of these gases are being created and trapped in our atmosphere, leading to increased global temperatures.

The Kyoto Protocol addresses the six main types of GHG emissions:

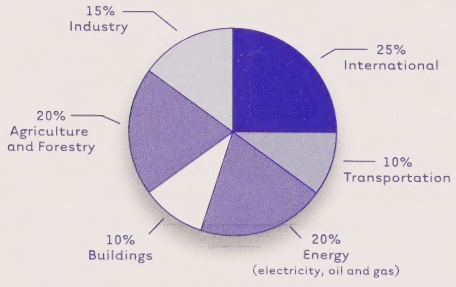
carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs) perfluorocarbons (PFCs), sulphur hexafluoride (SF_6)

Three of these gases are of particular concern because they are closely associated with human activities and are upsetting the natural balance of GHG that has existed in our atmosphere for thousands of years.

Carbon Dioxide (CO_2) — the most significant GHG released by human activities, primarily through the burning of fossil fuels. It is the main contributor to climate change.

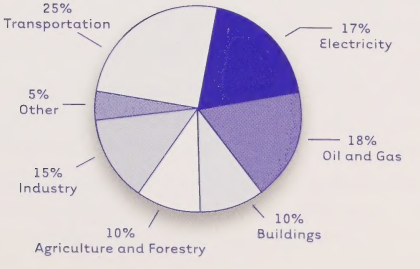
Methane (CH_4) — is produced when vegetation is digested or rotted without the presence of oxygen.

Nitrous Oxide (N_20) — occurs naturally in the environment, but human activities are increasing the quantities. Nitrous oxide is released when chemical fertilizers and manure are used in agriculture.



GHG Emission Reductions from *Action Plan (2000)*

The initiatives in *Action Plan 2000* will achieve GHG emission reductions of about 65 megatonnes per year during the commitment period of 2008 to 2012. The graph outlines the key areas that are expected to contribute to those emission reductions.



Percentage of GHG Emissions by Sector (1998)

The graph outlines Canada's 1998 emissions of GHGs by sector. 1998 is the most recent year for which emissions inventory data is available.

1. The Transportation Sector

Transportation is the largest source of GHG emissions, contributing about a quarter of Canada's total emissions. In this sector, emissions are growing rapidly and without further action, they could be 32 percent above 1990 levels by 2010.

While fuel efficiency is improving, it is not keeping pace with annual increases in the use of transportation. Measures are needed to ensure vehicles are more fuel-efficient and to increase the supply and use of lower-emitting fuels. A balanced approach is needed which addresses vehicle and fuel technology, behaviour change and infrastructure. Action in this sector will also contribute to cleaner urban air.

Measures in *Action Plan 2000:*

- *Fuel Efficiency* — Launch negotiations with the automobile industry and the United States to achieve new vehicle fuel efficiency targets by 2010. The objective is to phase in a significant voluntary improvement in fuel efficiency across Canada and the United States starting in 2004. This will be supported by a consumer education campaign to increase understanding of the importance of purchasing clean and efficient vehicles as well as good driving habits and maintenance practices.
- *New Fuels* — Increase the supply and use of ethanol produced from biomass such as plant fiber, corn and other grains. Blended with gasoline, this lower-emitting fuel is already being used in parts of Canada to reduce GHG emissions. The target set out in *Action Plan 2000* would increase Canada's ethanol production capacity by 750 million litres — triple our current capacity. This could enable as much as 25 percent of Canada's total gasoline supply to contain 10 percent ethanol, a blend that can be readily used in all cars. The Government of Canada will work with provinces and stakeholders in pursuing this initiative.
- *Fuel-Cell Vehicles* — Develop refuelling infrastructure for fuel-cell vehicles that emit low or no emissions. When hydrogen is the fuel, the only exhaust is water — but a convenient and commercial means of refueling is required to enable fuel-cell vehicles to become a viable alternative. This initiative would establish a Canadian transportation fuel-cell partnership, involving fuel-cell suppliers, fuel providers, the automobile industry and government. It will demonstrate options for refuelling as well as address regulatory barriers to the increased use of fuel-cell vehicles. Canada is a world leader in this new fuel-cell technology that has the potential to be a long-term answer to reducing GHG emissions. The Government of Canada will work with provinces, territories and partners in pursuing this initiative.
- *Freight Transportation* — Encourage efficiencies and technologies in aviation, rail, marine and trucking industries. This initiative develops partnerships and voluntary agreements with industry to encourage the take-up of best practices and technologies such as the use of synthetic fuels, improved fuel injection systems, and optimizing tire pressure.
- *Urban Transportation* — Demonstrate best urban transportation technologies and strategies to reduce GHG emissions. In partnership with provinces and municipalities, the Community Transportation Strategies and Technologies Initiative will showcase opportunities that reduce emissions from urban transportation. Pilot projects will demonstrate and evaluate a range of urban transportation options appropriate to local communities, including strategies such as the reduced use of cars, and shifts to less GHG-intensive travel alternatives. Four or five pilot projects, selected through a competitive process, will be developed with partners.

These measures build on existing Government of Canada initiatives such as:

- *Investing in New Technologies* — Since the mid-70s, the Government of Canada has been encouraging the development of alternative-transportation fuels and technologies. In the area of fuel cells, the Government of Canada has committed $100 million to the development of this innovative technology. This includes the establishment of the National Fuel Cell Research and Innovation Initiative.
- *Encouraging Consumer Action* — The EnerGuide for Vehicles program and the Fuel Consumption Guide provide new vehicle buyers with information on energy consumption and costs so they can compare different vehicles and purchase the most fuel efficient one to suit their needs.
- *Expanding Use of Alternative Fuels* — The Government of Canada is working with the alternative transportation fuels industry and major vehicle manufacturers to expand the use of fuels such as natural gas, ethanol, electricity and fuel cells.

2. The Energy Sector

Most GHG emissions come from the use of energy by industry and consumers. However, the production of energy from fossil fuels is also a significant source of GHG emissions. This section addresses emissions from the generation of electricity and the production of oil and natural gas. Activities from these two sectors together account for 35 percent of Canada's GHG emissions.

Oil and Gas Production

The oil and gas production sector accounts for 18 percent of Canada's GHG emissions. Driven largely by export growth as well as expansion in Canada's population and the economy, emissions in this sector are projected to climb to 65 percent above 1990 levels by 2010.

Measures in *Action Plan 2000:*

- *CO_2 Capture and Storage* — Undertake the preparatory work to ensure CO_2 capture and storage, an approach with high potential, is a viable option for Canada by:
  - creating an inventory of suitable sources and storage sites (coal beds, depleted oil and gas reservoirs and saline aquifers);
  - addressing regulatory and other barriers; and
  - supporting demonstration projects that build upon the Weyburn, Saskatchewan underground storage project.
- *Energy Efficiency* — Expand the Canadian Industry Program for Energy Conservation (CIPEC) to include the oil and gas sector. CIPEC is a government-industry partnership to improve energy efficiency and reduce CO_2 emissions.

These measures build on existing Government of Canada investments in:

- The *Weyburn CO2 Monitoring Project* in the Weyburn, Saskatchewan oil fields. PanCanadian Petroleum is using innovative technology to pump CO2 into oil-bearing formations to force out more oil and help researchers better understand the relationship between oil recovery, CO2 recycling and CO2 storage.
- A *Coal Bed Methane Development Project* to inject CO2 into deep coal beds, improving coal bed methane recovery.
- The *Petroleum Technology Research Centre* in Regina, Saskatchewan to co-ordinate the Weyburn CO2 Monitoring Project and encourage research into environmental challenges faced by the oil industry.

Electricity

Generating electricity from fossil fuels contributes close to 17 percent of Canada's GHG emissions. Emissions from this sector are growing and are expected to be 24 percent above 1990 levels by 2010. This sector has the potential for significant cost-effective emission reductions. The main areas for action include addressing barriers to transmission and trade, switching to lower carbon and emerging renewable energies, for example, wind and solar, and CO_2 capture and storage.

Carbon Dioxide (CO_2) Capture and Storage Initiative

This process, sometimes referred to as geological sequestration, involves the capture, treatment, transportation and injection of CO_2 deep underground. Considered safe and environmentally benign, CO_2 capture and storage has high potential in the Western sedimentary basin, as well as economic and environmental benefits. It is relevant to electricity generation and allows Canada to continue to expand its natural gas and oil production while avoiding some emissions. It can also be used to enhance oil recovery from existing fields and to recover natural gas (methane) from coal beds.

Northern and Aboriginal Communities

Northern and Aboriginal communities, especially in remote areas, face some of the highest energy costs in Canada.

Over the next two years, the Government of Canada will examine the opportunities for energy efficiency and early application of renewable-energy technology in remote communities that are not connected to Canada's electricity distribution network. This will be done in partnership with northern and Aboriginal communities, leaders, as well as provincial, territorial and Aboriginal governments and will include the identification of potential pilot projects. Through *Action Plan 2000*, the Government of Canada will work with northern and Aboriginal communities and businesses to develop specific opportunities for economic development in the energy sector in areas such as energy conservation, and alternative energies.

Measures in *Action Plan 2000:*

- *Emerging Renewable Energy* — Expand the use of low or non-emitting energy sources by four times current levels by:
  - purchasing 20 percent of federal electricity requirements from emerging low or non-emitting sources. The Government of Canada will seek partnerships with provinces and large electricity users in industry to support larger scale projects that will lower the cost of these technologies and make these sources of electricity a more viable option for industrial and residential consumers.
  - providing a financial incentive to emerging renewable energy distributors to stimulate sales in residential and small-business markets. This will encourage shifts in consumer behaviour that will expand the market for electricity from new non-emitting sources.
  - installing emerging non-GHG emitting technologies at government facilities.
  - installing emerging renewable technologies both in demonstration projects and to supplement diesel generation in remote and northern communities, which are not connected to the main electricity grid.
- *Sector Agreements/Covenants* — Initiate discussions with provinces, industry and electric utilities to develop sector agreements that will significantly reduce GHG emissions. This will be linked closely with parallel work to achieve clean air goals for this sector.
- *Carbon Dioxide Capture and Storage* — Work with provinces and territories and industry to encourage a capture and storage network and facilitate development and deployment of required technologies.
- *Reduce Barriers to Interprovincial Trade and Transmission of Electricity* — Work with interested jurisdictions on access to electricity grids for low and non-emitting generation and on reducing barriers to interprovincial transmission and trade. This will permit electricity from low and non-emitting sources, including hydroelectricity, to reach markets in neighbouring provinces.
- *Consumer Information* — Develop common methods for retailers to provide consumer information on sources and environmental attributes of electricity supply. This will enable consumers to reduce their emissions by choosing power from low and non-emitting sources.

These actions complement measures already undertaken to expand purchases of emerging renewable sources, such as:

- The Government of Canada currently purchases significant amounts of wind generated electricity for its facilities in Alberta. The local utility has built on this generating capacity and now sells four times this original purchase to other customers.
- Budget 2000 announced new "green power" purchases for some federal facilities in Saskatchewan and Prince Edward Island.

The measures in *Action Plan 2000* cover all components of the electricity sector and initiate actions to shift to cleaner sources of electricity. It provides benefits to all regions of Canada and will deliver clean air and health co-benefits by bringing emerging, non-emitting technologies into the market and by expanding the market for low and non-emitting sources of electricity.

3. The Industrial Sector

The industrial sector accounts for approximately 17 percent of Canada's GHG emissions. Emissions from this sector have been stable since 1990, reflecting major productivity gains and investments in new energy-efficient machinery and equipment.

The Government of Canada has worked closely with the industrial sector to improve energy efficiency for many years. *Action Plan 2000* expands on this base of programs.

Measures in *Action Plan 2000*:

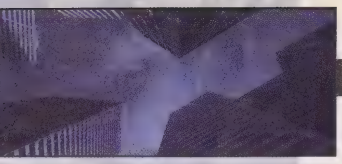
- *Canadian Industry Program for Energy Conservation (CIPEC)* — Expand this program of voluntary action across all industry sectors, and broaden efforts to encourage achievement of even greater energy efficiency.
- *Tracking and Reporting* — Improve statistics and surveys that provide the basis for reporting energy efficiency and GHG emissions by industry. Through *Action Plan 2000*, these surveys will increase data coverage, timeliness and reporting levels. This will help identify opportunities for GHG reductions, allowing industry to set targets and establish action plans.
- *Industry Benchmarking* — Provide confidential reports to companies comparing their relative productivity and energy-efficiency performance against that of others in their sector. This information will help industry identify opportunities to improve their competitiveness and GHG-reduction performance.
- *Energy Efficiency Site Audits* — Pinpoint specific opportunities for firms to improve energy efficiency and reduce GHG emissions within their operations. An audit program targeted mainly at small and medium-sized enterprises will be cost-shared with the industry.
- *Industrial Buildings Incentive Program* —Provide an incentive for new industrial buildings that exceed the *Model National Code for Buildings* by at least 25 percent.
- *Renewable Energy Technologies* — Provide incentives for increased use of technologies in the areas of biomass, active solar hot-water and air-heating systems, and ground-source heating.
- *Minerals and Metals Sector* — Reduce emissions by: enhancing metal recycling processes and practices; assessing alternate process and production approaches in high GHG-emitting activities; increasing the use of supplementary cementing materials; and, increasing awareness of the advantages of concrete roads for improving vehicle mileage.

Cross-Sectoral Measures

Action Plan 2000 contains measures to strengthen voluntary action across all sectors of the economy, and paves the way for possible market-based instruments in the future. Commitments in this area include:

- implementing baseline protection for those already taking action (to reduce uncertainty in the event a domestic emission-trading system is implemented);
- establishing a GHG-verification centre to accredit the verification of industry actions; and
- supporting pilot initiatives in conjunction with the provinces to encourage industries to implement real and verifiable early emissions reductions — while at the same time creating a body of knowledge and experience that will help develop future policies.

These actions build on the **Voluntary Challenge and Registry (VCR Inc.) and ÉcoGESte**. Through VCR Inc. and ÉcoGESte, companies register their intent to reduce their GHG emissions.



4. Buildings

Buildings, including residential, commercial and institutional, contribute directly to Canada's GHG emissions by burning fossil fuels to generate heat. This represents 10 percent of total emissions in Canada. In addition, the buildings sector contributes indirectly to GHG emissions through electricity consumption, such as lighting and power for work places.

The greatest immediate potential to reduce GHG emissions is through improving the energy efficiency of existing houses and buildings. Over the long term, however, the most cost-effective approach lies with building to the most energy efficient level possible in new construction. In addition to GHG reductions, actions in these areas will result in substantial benefits including greater home comfort, buildings and homes that are healthier for our families, and dollar savings.

Measures in *Action Plan 2000:*

- *Commercial Retrofits* — Encourage high-efficiency commercial and institutional building retrofits by providing information to decision-makers on the economic and environmental benefits, assessing increased access to financing and providing financial incentives, as well as workshops, publications and expert advice to help commercial entities take action.
- *Residential Buildings* — Broaden the existing *EnerGuide for Houses* rating system and promote construction and purchase of R-2000 houses. *Action Plan 2000* will support best practices, foster competition in the market, and develop retrofit guidelines for builders and renovators.
- *Standards for Equipment and Appliances* — Improve the energy efficiency of appliances through the development of standards for residential, commercial and industrial equipment. Accelerate the penetration of high-efficiency products by providing marketing and product certification assistance to encourage the purchase of "best in class" products.
- *Energy Code* — Upgrade the *Model National Energy Code for Houses* in partnership with the provinces and territories, and promote its adoption and implementation.

These measures build on existing Government of Canada programs such as:

- *Commercial Building Incentive Program* — Provides financial incentives to encourage building owners to incorporate energy-efficient technologies and practices in designs for new commercial and institutional buildings.
- *Energy Innovators Plus* — Encourages Canadian organizations to make energy-efficiency improvements throughout their operations to lower costs and reduce GHG emissions.
- *Renewable Energy Deployment Initiative* — Provides direct financial incentives to encourage businesses, government departments and others to install proven, cost-effective space/water heating and cooling systems that use renewable-energy sources. It also provides market development and industry infrastructure support.

Municipalities

Municipalities are a key partner in efforts to reduce GHG emissions and to improve air and water quality. Recognizing their important role, in Budget 2000 the Government of Canada provided $125 million through two funds designed to help municipalities take action.

The Green Municipal Enabling Fund ($25M) is a five-year fund that provides grants to cost-share audits and feasibility studies on projects designed to reduce GHG emissions and improve air and water quality.

The Green Municipal Investment Fund ($100M) provides loans and loan guarantees to enable recipients to carry out projects such as energy efficient building retrofits and public transit systems.

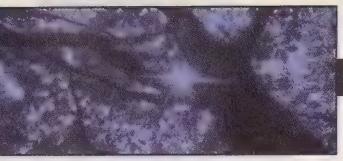
Government Operations: Doing our Share

The Government of Canada is the country's largest single enterprise. It is working to get its own house in order by setting a target of a 31 percent reduction in GHG emissions from its own operations by 2010.

Since 1990, through building retrofits, better fleet management, strategic "green power" purchases, and the downsizing of operations, the Government of Canada has already achieved a 19 percent reduction. The Government of Canada will reduce its emissions by a further 12 percent by 2010.

The Government of Canada will achieve its goal by additional building retrofits, fuel switching, and increased use of renewable energy within government operations. Moreover, the Government can help to "create the market" for certain new technologies on the verge of becoming viable.

Key departments, which are responsible for 95 percent of government GHG emissions, will be assigned specific targets and will be required to report annually on their progress.



5. Agriculture and Forestry

Agriculture and forestry are unique components of *Action Plan 2000* since both our agricultural soils and forests have the potential to remove carbon dioxide from the atmosphere.

Sinks

Sinks are defined in the United Nations Framework Convention on Climate Change as any process or activity that removes a GHG from the atmosphere. Photosynthesis (a natural biological process) removes carbon dioxide from the atmosphere, and as a result, Canada's forests and agricultural soils can act as carbon sinks through the accumulation of carbon.

Inclusion of the cycle of carbon in agricultural lands and managed forests is also essential to ensure the environmental integrity of the Kyoto Protocol.

Agriculture

About seven percent of Canada's land mass supports agriculture. Agriculture accounts for ten percent of Canada's GHG emissions. Unlike other sectors, these emissions are almost completely from non-energy sources. Nitrous oxides from fertilizers, and manure and methane from livestock account for 96 percent of agriculture emissions.

Adopting sustainable agriculture practices improves the capacity of soils to retain or absorb CO_2. Canada has, for many years, researched and demonstrated soil conservation methods that balance agricultural productivity and sequester carbon in the soil. Canada is negotiating internationally to have soil sinks included in the Kyoto Protocol.

Measures in *Action Plan 2000:*

- *Nutrient Management* — Develop education materials for crop advisors and independent agrologists as well as a network of successful innovators who can promote change and transfer the technology to others.
- *Livestock Management* — Promote best practices in manure storage and handling, feeding strategies and increasing the nutritional quality of pasture grasses.
- *Soil Management* — Implement best management practices in cooperation with soil-conservation organizations such as promoting the adoption of low tillage and other soil management practices, encouraging residue management, and conversion of marginal lands to forages.
- *Demonstration Farms* — Develop research pilot projects that further our understanding to enhance the carbon content of agricultural soils and reduce GHG emissions from agriculture.

These measures build on existing programs designed to advance our knowledge of agriculture GHGs in four main areas: increasing the pool of experts, creating scientific networks, disseminating research results, and coordinating climate change activities in Canada.

Agriculture is a shared jurisdiction and the Government of Canada will work closely with provincial partners in areas such as better management of cattle and hog-farming operations, applications of fertilizers, tillage practices and the management of soil sinks.

Forestry

Forests cover 45 percent of the Canadian landscape and are a dominant feature of our economy and culture. Canada is proposing that the Kyoto Protocol take a comprehensive approach to coverage of this sector based on sustainable forestry management. Forests and forest soils remove and store large amounts of carbon dioxide and the sustainable management of forests can optimize the amount of carbon sequestration.

Measures in *Action Plan 2000:*

- *Afforestation* — Design and develop a program for marginal agricultural lands in Canada, including regional pilots in cooperation with provinces. Internationally, afforestation is generally defined as the planting of trees where previously there had not been forests.
- *Shelterbelt* — Expand existing shelterbelt programs with a focus on prairie cropland.

These measures build on existing Government of Canada actions such as:

- *Carbon Budget Models* — Develops models that demonstrate the role of forests in the carbon cycle and how climate change may affect our forests.
- *Continued Partnerships* — The Government of Canada is already working closely with the provinces, territories and industry to develop forestry options that will increase carbon sequestration and forest-management practices that will help our forests adapt to a changing climate.

Climate Change Action Fund

The Government of Canada established the Climate Change Action Fund (CCAF) in 1998 to help Canada reduce its GHG emissions. Through the CCAF, the federal government is taking concrete and immediate steps to engage governments, businesses, communities and individual Canadians to address climate change. Funded at $50 million a year, Budget 2000 extended the highly successful CCAF for three more years to 2003-2004. As well, Budget 2000 renewed various energy efficiency and renewable energy programs by $60 million over three years.

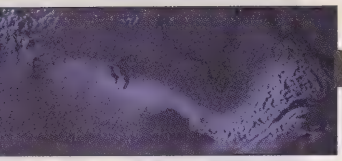
The CCAF has four components: Public Education and Outreach, Science Impacts and Adaptation; Technology Early Action Measures and Foundation Analysis.

Public Education and Outreach is increasing Canadians' awareness and understanding of climate change and how they can do their part to reduce emissions.

The **Science, Impacts and Adaptation** component supports critical research and analysis to improve our understanding of climate change, its impacts and how to best adapt.

The **Technology Early Action** component provides support, on a cost shared basis for the demonstration and deployment of technology projects to reduce GHG emissions nationally and internationally.

The **Foundation Analysis** component supports the national climate change process as well as policy and options development, economic analysis and modelling, emissions inventories, and analysis of domestic emissions trading.



6. Supporting Canadian Projects in Other Countries

Climate change is a global phenomenon. Canada intends to achieve the majority of its emission reductions at home because of the economic, competitiveness and clean air benefits that come with these investments. However, the Government of Canada will support the private sector in maximizing export opportunities and pursuing cost effective emission reduction projects abroad. Such measures would complement technology transfer to the developing world and economies-in-transition, and promote sustainable economic growth.

Under the Kyoto Protocol, emission reductions achieved in other countries as a result of Canadian projects earn "credits" that contribute to Canada meeting its Kyoto commitment. These mechanisms are called the Clean Development Mechanism (CDM) and Joint Implementation (JI). CDM is intended to start in 2000 once the rules are settled in the international negotiations.

Measures in *Action Plan 2000:*

- *CDM/JI Office* — Facilitate trade opportunities for Canadian companies to initiate and implement CDM/JI projects to maximize low-cost emission-reduction opportunities.
- *Technology Marketing* — Market Canadian technology internationally through technology-promotion officers, Canadian-based technology trade facilitation and technology showcasing, and provide detailed international market analyses. This would also facilitate trade opportunities focusing in countries with a positive environment for CDM/JI projects.

These international measures build on existing Government of Canada initiatives such as:

- A Budget 2000 commitment of $100 million over four years to help developing countries undertake projects to reduce GHG emissions through technology transfer and related sustainable development initiatives.
- Canada's $15 million investment in the World Bank's Prototype Carbon Fund, which invests in reduction projects in developing countries and eastern Europe, with emission reduction credits being shared amongst the investors.

7. Investing in Future Solutions

Science and Adaptation: understanding what climate change means for Canadians

Our scientific understanding of climate change is sound and leaves no doubt that it is essential to take action now to reduce emissions. However, we must continue to improve our understanding of how a changing climate will affect Canadians and the ways to adapt to future impacts of climate change.

Measures in *Action Plan 2000:*

- *Climate Monitoring* — To fill critical gaps in our national network, particularly in the North.
- *Sinks* — Enhance understanding of potential of forests and agricultural soils to store carbon.
- *Impacts and Adaptation*
  - Link Canadian researchers to further assess the impacts of and adaptation to climate change in all regions of Canada; and
  - Develop strategies to help Canadians in various sectors adapt to a changing climate.

These measures build on the $60 million provided in Budget 2000 to establish the Canadian Foundation for Climate and Atmospheric Sciences.

Technology — continuous innovation is essential

New, clean technologies are key to current and future emission reduction efforts. Technological innovation is an integral component of *Action Plan 2000* measures in every sector. Some initiatives directly support the development of new technologies and others propose investments to create an environment in which clean technologies can prosper.

Measures in *Action Plan* 2000:

- *Discovery, Research and Development* — Find new ideas through discovery competitions, develop these ideas through basic university research, and support their advancement through applied research and technology development.
- *Fostering a Collaborative Approach* — Develop networks and technology roadmapping among the players in the private sector, academia and governments, and a national forum to exchange information.
- *Technology Marketing* — Support the business environment for innovation through analysis of international market opportunities and showcasing Canadian technology to a wide range of domestic and international markets.

In addition, *Action Plan 2000* places an emphasis on getting technologies into the market and creating consumer choice through renewable energy and technology procurement, fuel-cell refuelling infrastructure and standards for appliances and equipment.

The initiatives in this *Action Plan 2000* build on significant investment in emerging energy technologies made by the Government of Canada, including:

- *Government of Canada Technology Investments* including the Program of Energy Research and Development, the Industry Energy Research and Development Program, the Industrial Research Assistance Program, Technology Partnerships Canada, and the Environmental Technology Advancement Program.
- *Climate Change Action Fund's Technology Early Action Measures* supports early-action technology projects to reduce GHG emissions while sustaining economic and social development.
- The *Sustainable Development Technology Fund* — Budget 2000 provided an initial $100 million investment. The Fund, once established, will stimulate the development and demonstration of sustainable development technologies, in particular, those related to climate change and clean air solutions.

The Benefits from Acting Now and Next Steps

The initiatives outlined in *Action Plan 2000* will take Canada one third of the way to achieving the target established in the Kyoto Protocol. In addition, they will provide economic benefits from energy savings, health and environmental benefits from cleaner air and technological benefits from expanded use of renewable energy. They will also put Canada on the road to becoming a world leader in sustainable development and one of the smartest and most sophisticated nations in the production and use of all forms of energy.

Canada is now entering a new stage in addressing climate change. After more than two years of intensive analysis and consultations, federal, provincial and territorial governments are now focusing on the actions needed to reduce Canada's GHG emissions.

Through *Action Plan 2000*, and Budget 2000, the Government of Canada intends to invest up to $1.1 billion in *Canada's First National Climate Change Business Plan*. *Action Plan 2000* is an intention to invest up to $500 million over the next five years in a comprehensive package of measures to reduce Canada's GHG emissions by 65 megatonnes a year, when fully implemented.

Over the next few months, the Government of Canada will further develop these proposals. It will work with provincial and territorial governments, and stakeholders to fine tune the measures, and seek partnerships and contributions.

This Business Plan is the first in a series of Plans that Canada will undertake over the coming years. The Government of Canada is continuing to analyze future options including domestic emissions trading. As the international rules for implementing the Kyoto Protocol become clearer, further Business Plans will be developed to ensure Canada achieves its climate change commitments.

RENEWABLE AND ALTERNATIVE ENERGY SOURCES

The *Government of Canada Action Plan 2000 on Climate Change* sets out a package of initiatives to reduce greenhouse gas (GHG) emissions in key sectors, positioning us for sustained economic growth and increased Canadian competitiveness. The Plan includes a number of measures to develop and deploy emerging renewable and alternative energy sources to meet the demand for energy while decreasing emissions.

Renewable energy sources, such as solar, wind, hydroelectricity, earth and biomass energy produce electricity or thermal energy without depleting natural resources. Alternative energy sources include fuel cells and cogeneration technology (producing both electricity and usable heat at the same time), as well as fuels such as ethanol used in transportation.

Canada is a world leader in the production of renewable energy; 17 percent of our primary energy supply comes from renewable sources. Canada is internationally renowned for renewable and alternative energy technologies, including hydro, solar, photovoltaics, wind energy, ground-source heat pumps, bioenergy and fuel cells. *Action Plan 2000* builds on Canada's expertise in renewable and alternative energy and our renewable resources.

***Action Plan 2000* Measures**

The renewable and alternative energy industries have been extensively involved in the two-year consultation process. *Action Plan 2000* captures many of the best ideas resulting from this process. Specific initiatives to support the research, development and deployment of renewable and alternative energy technologies include:

- creating a Canadian transportation fuel cell partnership, which will involve fuel-cell suppliers, fuel providers, the automobile industry and government.
- encouraging the construction of biomass-based ethanol plants to increase the supply of ethanol-blended gasoline. This initiative could enable as much as 25 percent of Canada's total gasoline supply to contain 10 percent ethanol, a blend that is readily used in all cars.
- expanding the market for emerging renewable energy by increasing the Government of Canada's electricity purchases from emerging low- and non-emitting energy sources to 20 percent.
- providing financial incentives to stimulate the development and marketing of a targeted amount of emerging low- and non-emitting electricity capacity.
- installing emerging low- and non-emitting electricity technologies in Government of Canada facilities and properties.
- bolstering funding to the Renewable Energy Deployment Initiative program to increase the promotion of renewable energy technologies, such as solar and ground-source water-heating technologies, to the industrial sector.

Successful Investments
Some Government of Canada programs to advance renewable and alternative energy technologies include:

- **Renewable Energy and Hybrid Systems for Remote Communities Program** supports the development and deployment of renewable energy technologies in remote communities, such as those in the North, that rely on high-cost and high-emissions fuel oil for electricity generation and space and water heating. The program will develop and implement photovoltaic technologies.

- **Renewable Energy Technologies Program** supports Canadian industry efforts to develop renewable energy technologies, including active solar, wind energy, small hydro (less than 20 megawatts) and bioenergy. Activities also include technology development and laboratory services for bioenergy technologies and the transfer of renewable technologies abroad.

- The **Sustainable Development Technology Fund** was announced in Budget 2000 and will, once it is established, stimulate the development and demonstration of sustainable development technologies, in particular, those related to climate change and air-quality solutions.

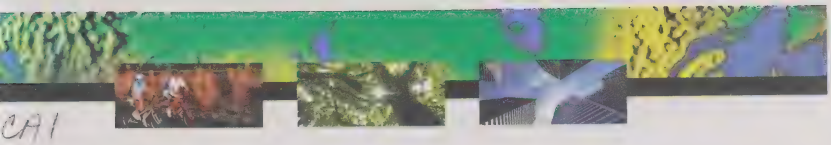
- **Technology Early Action Measures (TEAM)** provides support, on a cost-shared basis, for the demonstration and deployment of technology projects to reduce GHG emissions nationally and internationally.

- **Renewable Energy Deployment Initiative** is designed to stimulate market demand for renewable energy for space/water heating and cooling. Eligible businesses and corporations can receive a 25 percent contribution (to a maximum of $50,000) toward the purchase and installation costs of qualifying renewable energy systems, including solar air, solar hot water and high efficiency, low-emissions biomass combustion systems.

- **Government of Canada "Green Power" Initiative** began when Natural Resources Canada and Environment Canada contracted to purchase their electricity in Alberta from renewable sources. Budget 2000 committed an additional $15 million to expand Government of Canada green power purchases into Saskatchewan and Prince Edward Island.

The Way Forward
Action Plan 2000 reflects the Government of Canada's contribution to the First National Climate Change Business Plan that is being developed with the provinces and territories. Over the next few months, the Government of Canada will work with provincial and territorial governments, and stakeholders, to fine-tune the measures and seek partnerships. Funding for the final package of measures will be confirmed in Budget 2001.

More information on climate change is available on the Government of Canada's Climate Change Web site at www.climatechange.gc.ca.



TECHNOLOGY

The *Government of Canada Action Plan 2000 on Climate Change* sets out a package of initiatives to reduce greenhouse gas (GHG) emissions in key sectors, positioning us for sustained economic growth and increased Canadian competitiveness. Technological innovation is an integral component of measures in every sector — both in commercializing emerging technologies and in developing innovative approaches to reducing emissions.

Investments in promising technologies can lead to significant reductions in greenhouse gas emissions if they are used throughout the economy. Their use will also lead to new business opportunities, increased domestic and international market potential and strategic global positioning. By creating an environment in which these technologies can prosper, Canada is encouraging further development and capitalizing on the opportunity to show leadership in sustainable development.

***Action Plan 2000* Measures**

Initiatives in *Action Plan 2000* capture many of the best ideas resulting from an extensive, two-year consultation process. *Action Plan 2000* includes measures across all Canadian industrial sectors but targets key sectors that together account for over 90 percent of Canada's GHG emissions. Some initiatives directly support the development of new technologies and others propose investments to create an environment in which clean technologies can prosper.

- **Discovery, Research and Development** – find new ideas through discovery competitions, develop these ideas through basic university research, and support their early advancement through applied research and technology development.
- **Fostering a Collaborative Approach** – develop networks and technology roadmapping among the players in the private sector, academia and governments, and a national forum to exchange information.
- **Technology Marketing** – support the business environment for innovation through analysis of international market opportunities and showcasing Canadian technology to a wide range of domestic and international markets.

In addition, *Action Plan 2000* places an emphasis on getting technologies into the market and creating consumer choice through, for example, renewable energy and technology procurement, fuel-cell refuelling infrastructure, and standards for appliances and equipment.

The initiatives in *Action Plan 2000* build on significant investment in emerging energy technologies made by the Government of Canada over the past 25 years. Recently, the Government of Canada has intensified its investment in technologies specifically focussed on climate change, for example, the Climate Change Action Fund's Technology Early Action Measures and the Sustainable Development Technology Fund, which was announced in the 2000 federal budget.

Successful Investments Promote Innovation

Technology development takes time, money, commitment and imagination. Many of the promising technologies now entering the market are the result of years of effort and support by the Government, through its own in-house research activities and through funding for research and development of a wide range of technologies in the private sector, academia and other research agencies.

Some successful Government of Canada investments in technological innovation:

- Iogen Corporation, in partnership with Petro-Canada, is demonstrating a cost-effective new process for producing ethanol from agricultural residues.
- RETSCREEN™ International, an advanced software tool for buildings and industry, helps users identify energy-efficiency savings and encourages the use of renewable energy systems. Developed by Natural Resources Canada, this software now has 10,000 users in 170 countries.
- Ballard Power Systems Inc. received Government of Canada support for many years, from the first developmental stages of the revolutionary fuel cell, through its demonstration with the launch of the world's first fuel-cell-powered bus in 1993, to Xcellsis, a joint venture including DaimlerChrysler and Ford Motor Company to develop fuel-cell engines for cars.
- Stuart Energy of Toronto is working on a refuelling infrastructure for hydrogen fuel-cell vehicles, Dynetek Industries Ltd. of Calgary is developing high-pressure hydrogen storage cylinders, and Global Thermoelectric of Calgary is developing advanced solid-oxide fuel cell technology for electricity generation and on-board auxiliary power for vehicles.
- The Advanced Integrated Mechanical Systems (AIMS) project helps manufacturers develop products and the market infrastructure for natural gas-fuelled appliances that integrate ventilation, space and hot-water heating into a single system.

The Way Forward

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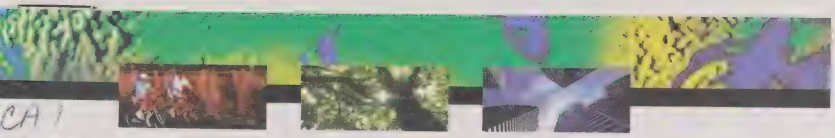

CANADA'S NORTH

Territorial leaders, Aboriginal and Inuit elders are telling us that they are already experiencing the effects of climate change. In the past 40 years, annual temperatures in the western Arctic have climbed by 1.5 degrees C while those over the central Arctic have warmed by 0.5 degrees C. Scientists consistently project that in the 21st century, northern latitudes will experience more warming than anywhere else in the world. The Arctic, in fact, has a history of sensitivity to global warming. As a northern nation, Canada is therefore expected to experience a greater degree of warming than countries closer to the equator. As the world's climate changes, temperature changes are anticipated to be greater in the North, and greater in winter than in summer. According to studies by Environment Canada, a doubling of CO_2 emissions could cause temperature increases of nearly 5 degrees°C in summer and 5-7°degrees C in winter over mainland areas of the Canadian Arctic.

Climate Change Impacts in the North
The Arctic being extremely vulnerable to climate change, it is expected that there will be major physical, ecological, sociological and economic impacts that could include:

Impacts on Human Communities: Changes in sea ice, snow cover, habitat, and wildlife could disrupt the traditional lifestyle of indigenous peoples. Thawing permafrost and shorter winters could impede the only ground transportation across frozen ground and water, increasing economic costs. Recently, winter ice roads in the Mackenzie Valley have required more maintenance and have closed earlier than usual, restricting use of this important transportation system. In some areas, the arrival of the animals and birds important for annual hunts has become disconnected from the timing of solar seasons. New species have been spotted for the first time in human memory. Climate change is expected to bring more storms, floods and other deviations from climatic "norms" which poses risks to coastal communities, water users, transportation, municipalities and human health.

Changes in Sea Ice: A recent atmosphere-ocean climate model projects a 60% reduction in sea ice under a scenario in which CO_2 is doubled. Over the last 100 years, there has already been a significant decline of Arctic ice cover extent and thickness.

Changes in Permafrost: Today's permafrost boundaries are projected to move poleward. Thawing of permafrost could alter drainage patterns and landscape, and cause severe damage to buildings, transportation infrastructure and pounded lakes.

Changes in Arctic Wildlife: Although warming may increase biological production, the distribution of species could change. Important wetlands may disappear, which could significantly affect ducks and other waterfowl. As the amount of sea ice decreases, seals, walruses, polar bears and other species that depend on it would suffer.

The basic science on climate change is sound. However, the impacts in Canada will be unique and vary from region to region. We must improve our understanding of how a changing climate will affect Canadians and how we can all adapt to it. Adaptation involves taking action to minimize the negative impacts of climate change - and taking advantage of new opportunities that may arise.

***Action Plan 2000* Measures**
Northern and Aboriginal communities, especially in remote areas, face some of the highest energy costs in Canada. Specific initiatives to support the research in the Arctic include:

- examine the opportunities for energy efficiency and early application of renewable-energy technology in remote communities that are not connected to Canada's electricity distribution network.
- work with northern and Aboriginal communities, and businesses to develop specific opportunities for economic development in the energy sector in areas such as energy conservation and alternative energies.
- fill critical gaps in our monitoring networks.
- provide climate change information and training to communities, community planners, leaders and elders.

Taking Action – Furthering science, and developing adaptation strategies
The Government of Canada has been working to understand climate change in the Arctic. The Science, Impacts and Adaptation component of the Climate Change Action Fund identified the Arctic as a research priority. This Fund supports projects to give northern scientists, decision-makers and residents a better understanding of how climate change will affect the North. These projects enhance the observation of the climate in the North, increase our understanding of the way the climate system works in Arctic Canada, and improve climate model projections. Some of the Government of Canada's programs and initiatives include:

Canadian Glaciology Program: The world's ice caps provides an excellent layer-by-layer record of past temperatures, snow accumulation and atmospheric concentrations of greenhouse gases. The program, which collects and analyses cores from high Arctic and Cordilleran glaciers, contributes to the international body of knowledge that is needed to understand climate change.

Oceans and Arctic Climate Change Research: Canadian scientists are conducting research in the Arctic and the oceans on both coasts to better understand how changes in the marine environment will impact fish species distribution and abundance, and on coastal communities and their economies. Better ocean measurements and characterization, and a better understanding of ocean/atmosphere processes will improve climate prediction.

The Climate Research Network: This program consists of a network of nine collaborative research groups in 12 Canadian universities, one of which focuses on climate modeling in the Arctic.

On the International Scene: Canada continues to participate in international science fora, such as the World Climate Research Programme, the International Council for Science, the Intergovernmental Oceanographic Commission of UNESCO, and the Intergovernmental Panel on Climate Change.

The Way Forward

Action Plan 2000 reflects the Government of Canada's contribution to the First National Climate Change Business Plan that is being developed with the provinces and territories. Over the next few months, the Government of Canada will work with provincial and territorial governments, and stakeholders, to fine-tune the measures and seek partnerships and contributions. Funding for the final package of the measures will be announced in Budget 2001.

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